

**United States Naval Academy
Mechanical Engineering Department**

EM443 ENERGY CONVERSION

Catalog Description: EM443 - ENERGY CONVERSION **Credit:** 3(3-0-3)

Introduction to energy conversion and utilization. Terrestrial and thermodynamic limitations, direct energy conversion devices, alternative energy sources, present and future energy research and development, energy device design, and energy usage and economy are presented.

Corequisites: EM319 or equivalent.

Textbook: None

Reference: Supplementary notes by Professor Chih Wu

Course Director: Professor Chih Wu

Objectives¹:

1. To develop a basic knowledge of energy conversion devices, and apply engineering and computer science to analyze, simulate and design energy devices. (a,b,c,d)

Course Content:

| # | Topic or Subtopic | # hrs |
|---|--|-------|
| 1 | Energy crisis, consumption, production | 3 |
| 2 | Terrestrial limitations and environments | 4 |
| 3 | Thermodynamics and finite-time thermodynamics | 4 |
| 4 | Current energy devices and potential improvement | 3 |
| 5 | Direct solar energy systems | 6 |
| 6 | Indirect solar energy systems | 9 |
| 7 | Direct energy conversion devices | 9 |
| 8 | Energy conversion device simulation and design | 4 |

Evaluation:

1. Quizzes
2. Homework
3. Term paper

Acquired Abilities²:

- 1.1 Students will demonstrate the ability to understand energy crisis, consumption, and

- production (1,2).
- 1.2 Students will demonstrate the ability to understand terrestrial limitations and environments (1,2).
 - 1.3 Students will demonstrate the ability to understand finite-time thermodynamics (1,2,3).
 - 1.4 Students will demonstrate the ability to know current energy devices and their potential improvement (1,2,3).
 - 1.5 Students will demonstrate the ability to know direct solar energy and indirect solar energy, and to design their own systems (1,2,3).
 - 1.6** Students will demonstrate the ability to know direct energy conversion devices, and to design their own systems (1,2,3).

Date of Latest Revision: 25 SEP 2001